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| 10/821,794 | 04/09/2004 | Israel Morejon | 09752.105001 | 9338 |
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| KING & SPALDING LLP 1180 PEACHTREE STREET ATLANTA, GA 30309-3521 | | | EXAMINER WONG, LINDA | |
| | | | ART UNIT 2611 | PAPER NUMBER |
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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|------------------------------|--------------------------------------|---------------------------------------|--|
| Office Action Summary | Application No. 10/821,794 | Applicant(s) MOREJON ET AL. | |
| | Examiner Linda Wong | Art Unit 2611 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 October 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-4,6-14,16 is/are rejected.
- 7) ☒ Claim(s) 2,5 and 15 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Response to Arguments

1. Applicant's arguments, see Applicant's Remarks, filed 10/23/2007 have been fully considered and are persuasive. The rejections of 35 USC 101 and 35 USC 112 has been withdrawn.
2. Applicant's arguments with respect to claims 1-16 have been considered but are moot in view of the new ground(s) of rejection.

Claim Objections

3. **Claim 3** is objected to because of the following informalities: **Claim 3** recites the limitation "N by N matrix", wherein N is not defined. For example, if N is an integer, N must be defined as an integer or with a value. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. **Claims 1,3,10-12** are rejected under 35 U.S.C. 103(a) as being unpatentable over Leus et al (EP Patent No.: 0967763) in view of Murphy (US Publication No: 20030195913).
 - a. **Claim 1**,
 - i. Leus et al discloses

- receiving frames of data (paragraph 0002 discloses “multicarrier receiver which is able to receiver a sequence of cyclically extended multicarrier symbols”)
 - estimating values of taps of a frequency domain equalizer (FEQ) with an averaging technique that removes noise (paragraphs 31,33 and equation 3 shows the weights being calculated)
 - minimizing lengths of the taps using the data (paragraphs 31,33 discloses optimizing the taps of the per-carrier frequency domain equalizer)
 - calculating values of the taps with the estimated values and a matrix using the data (equation (2))
 - generating an average of the frames of data (Fig.3, label sliding FFT and paragraph 31 discloses the sliding FFT generates the Fourier transform from the first sample and then the second sample.)
- ii. Leus et al fails to disclose “N log N matrix inversion solution” used to calculate the coefficients.
- iii. Murphy discloses such a limitation. (paragraph 88 discloses computing coefficients using the DFT. paragraph 91 discloses the multiplication used to compute the output of the DFT is an N log N multiplication operation. Paragraph 151 discloses using an inverse correlation matrix to update filter coefficients.) It would have been obvious to one skilled in the art to use the mathematical method, N log N matrix inversion solution, as defined by

Murphy when computing coefficients for an equalizer into Leus et al's invention to reduce multiplication operations cost.

- b. **Claim 3**, Leus et al discloses "minimizing lengths of taps further comprises multiplying each row of an N by N matrix with the pilot signal". (paragraphs 31 and 33 discloses minimizing the taps and paragraph 23 discloses using training symbols. Equation 1 shows the N by N matrix tap coefficients.)
- c. **Claim 10**, Leus et al discloses "converting the training signal into parallel signals; and removing a cyclic prefix from the parallel signals". (Fig. 2, label S/P' and paragraph 0027 discloses "the cyclic prefix extractor CE EXTRACT subtracts the cyclic extension CE from the multi-carrier symbol MS")
- d. **Claim 11**, Leus et al discloses "transforming received parallel signals using a sliding discrete Fourier transform". (Fig. 2, label sliding FFT)
- e. **Claim 12**, Regarding the limitation "a communications receiver having computer-executable instructions" for performing the steps, the claimed limitation would be required within a system in order to continuously calculate taps or weights of the equalizer. Leus et al discloses calculating the weights or taps. (paragraphs 31,33) Thus, Leus et al would require a computer executable medium to perform the instructions.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. **Claim 4** is rejected under 35 U.S.C. 103(a) as being unpatentable over Leus et al in view of Murphy as applied to claim 1, in view of Van Acker et al (Publication Title: "Per tone Equalization for DMT-Based Systems").

a. **Claim 4,**

- i. Leus et al fails to disclose "calculating values of the taps with a matrix and the data further comprises calculating values of the taps with a Toeplitz matrix having a structure" as recited in the limitations "where Y is a $(N \times T)$ Toeplitz matrix of received signal samples, y is demodulated output, $s = N+v$ and is a length of a symbol including prefix, N is a symbol size expressed in samples, k is a time index, and v is a length of a cyclic prefix".
- ii. Van Acker et al discloses such a limitation. (equation 3) It would have been obvious to one skilled in the art to incorporate such a limitation so to optimize per tone so to optimize equalization.

6. **Claims 6-9** are rejected under 35 U.S.C. 103(a) as being unpatentable over Leus et al in view of Murphy as applied to claim 1, in view of Rezvani (US Patent No.: 7106789).

a. **Claim 6,**

- i. Leus et al in view of Murphy fails to disclose "storing a frame of data in the receiver comprising one or more symbols".

- ii. Rezvani discloses such a limitation. (Col. 4, lines 30-35) It would have been obvious to one skilled in the art at the time of the invention to incorporate the limitation as disclosed by Rezvani in to Leus et al's invention so to provide continuous and easy access to data when data is needed.

b. Claim 7,

- i. Leus et al in view of Murphy fails to disclose "applying a synchronization delay to the signal".
- ii. Rezvani discloses such a limitation. (Fig. 2, label T1 frame synch, Fig. 3b, label frame aligner, Col. 4, lines 41-51) It would have been obvious to one skilled in the art at the time of the invention to incorporate synchronization delay as disclosed by Rezvani into Leus et al so to compensate for different rate information. (Col. 1, lines 41-59)

c. Claim 8,

- i. Leus et al in view of Murphy fails to disclose "aligning received frames of data based on the stored frame".
- ii. Rezvani discloses such a limitation. (Fig. 3b, labels 306,308,310,302) It would have been obvious to one skilled in the art at the time of the invention to incorporate "aligning received frames of data based on the stored frame" as disclosed by Rezvani into Leus et al's invention so to compensate for different rate information. (Col. 1, lines 41-59)

d. Claim 9,

- i. Leus et al in view of Murphy fails to disclose "resetting a frame counter".
- ii. Rezvani discloses such a limitation. (Fig. 3b, label frame aligner, Fig. 5 shows the pointer for the frame is determined and reset when a new frame is being analyzed) It would have been obvious to one skilled in the art to incorporate such a limitation as disclosed by Rezvani into Leus et al so to compensate for different rate information. (Col. 1, lines 41-59)

7. **Claims 13-14** are rejected under 35 U.S.C. 103(a) as being unpatentable over Leus et al in view of Murphy as applied to claim 1, in view of Smart et al (US Patent No.: 6735255).

a. **Claim 13,**

- i. Leus et al discloses
 - "a T-tap time domain equalizer (TEQ) for shortening lengths of a channel input response of a received signal" (Fig. 1, label TEQ)
 - "a frequency domain equalizer (FEQ) comprising N 1-tap filters for correcting" (Fig. 2, label FEQ)
 - "the processing unit responsive to the instructions of the program, operable for estimating values of taps of a frequency domain equalizer (FEQ) with an averaging technique that removes noise" (paragraphs 31,33 and equation 3 shows the weights being calculated)

- “minimizing lengths of the tap filters for the frequency domain equalizer (FEQ)” (paragraphs 31,33 discloses optimizing the taps of the per-carrier frequency domain equalizer)
 - “calculating values of the taps with the estimated values and a matrix” (equation (2))
- ii. Leus et al fails to disclose
- A. “a phase rotation and an amplitude attenuation of the received signal”
 - B. “a processing unit”
 - C. “a memory storage device” and
 - D. “a program stored in the memory storage device for providing instructions to the processing unit”
 - E. “an $N \log N$ matrix inversion solution”
- iii. Smart et al discloses such limitations. (**Limitation A:** Fig. 4, labels phase rest, pilot phase, 408, Fig. 7; **Limitation B:** Fig. 2, label dsp; **Limitation C:** Fig. 4, label 422; **Limitation D:** Fig. 2, label DSP, wherein a program would be stored in memory so to perform the instructions) It would have been obvious to one skilled in the art at the time of the invention to incorporate the limitations as disclosed by Smart et al into Leus et al’s invention so provide a optimize the equalizer by providing adjustable weights using components required to perform calculations of the weights.
- iv. Murphy discloses limitation E. (**Limitation E:** paragraph 88 discloses computing coefficients using the DFT. Paragraph 91 discloses the

multiplication used to compute the output of the DFT is an $N \log N$ multiplication operation. Paragraph 151 discloses using an inverse correlation matrix to update filter coefficients.) It would have been obvious to one skilled in the art to use the mathematical method, $N \log N$ matrix inversion solution, as defined by Murphy when computing coefficients for an equalizer into Leus et al's invention to reduce multiplication operations cost.

- v. **Claim 14**, Leus et al discloses "the processing unit is further operable for generating an average of received frames of data". (Fig.3, label sliding FFT and paragraph 31 discloses the sliding FFT generates the Fourier transform from the first sample and then the second sample.)

- 8. **Claim 16** is rejected under 35 U.S.C. 103(a) as being unpatentable over Leus et al in view of Murphy in view of Smart et al as applied to claim 13, further in view of Van Acker et al (Publication Title: "Per tone Equalization for DMT-Based Systems").

a. **Claim 16**,

- i. Leus et al in view of Murphy in view of Smart et al fails to disclose "calculating values of the taps with a matrix and the data further comprises calculating values of the taps with a Toeplitz matrix having a structure" as recited in the limitations "where Y is a $(N \times T)$ Toeplitz matrix of received signal samples, y is demodulated output, $s = N+v$ and is a length of a symbol including prefix, N is a symbol size expressed in samples, k is a time index, and v is a length of a cyclic prefix".

- ii. Van Acker et al discloses such a limitation. (equation 3) It would have been obvious to one skilled in the art to incorporate such a limitation so to optimize per tone so to optimize equalization.

Allowable Subject Matter

9. **Claims 2,5,15** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).
11. A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Linda Wong whose telephone number is 571-272-6044. The examiner can normally be reached on 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Payne can be reached on (571) 272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Linda Wong
1/3/2008


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SUPERVISORY PATENT EXAMINER